Rebalancing Through Market Drawdowns

A prudent approach can be critical when markets are stressed.

May 2020

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KEY INSIGHTS

- Although investors may be reluctant to add to higher-risk exposures in a market drawdown, we believe it is essential to maintain a prudent rebalancing approach.
- Our analysis of historical and simulated market drawdowns suggests that rebalancing potentially improves outcomes relative to a non-rebalanced portfolio.
- We believe investors should select the rebalancing rule that they think is most appropriate and adhere to it through all periods, including market drawdowns.

Rebalancing asset exposures is fundamental to prudent portfolio management and has long been considered a key determinant of long-term performance. Regularly reorienting to targeted long-term asset allocations helps ensure that all risk exposures in the portfolio are intentionally accepted. However, many investors may be reluctant to follow their normal rebalancing policies in periods of market stress, when adding to higher-risk exposures may seem particularly unpalatable.

We believe it is essential that investors maintain a prudent rebalancing approach. Our analysis of both historical and simulated equity market drawdowns found that sticking to an investment policy's rebalancing rule typically led to better outcomes when compared with a passive strategy of allowing portfolio exposures to drift with market movements.

In this paper, we analyze the impact of various rebalancing methods in both historical and simulated market drawdowns. We compare various rebalancing rules: two of them calendar-based (monthly and quarterly) and two that rely on exposure bands (±2.5% and ±5.0%). Our findings suggest that during market drawdowns and subsequent price recoveries:

- Using Monte Carlo analysis, we found that all of the rebalancing rules we tested outperformed a non-rebalanced portfolio in at least 90.9% of simulated scenarios.
- In our simulations, certain rebalancing methods potentially outperformed others during specific types of market drawdowns. However, it is impossible for investors to know in advance the type of drawdown they are experiencing.
- Our simulations suggested that there is no "silver bullet" rebalancing rule,

> We believe it is essential that investors maintain a prudent rebalancing approach.

given the multiple considerations that need to be addressed when designing and maintaining rebalancing policies.

We believe investors should select the rebalancing approach that they believe is most appropriate for them, given their own circumstances, and adhere to it through all periods, especially during market drawdowns and recoveries.

The Importance of Rebalancing

Establishing and implementing a portfolio rebalancing policy is widely believed to improve portfolio performance over full market cycles. Over rolling 10-year periods since 1989, any of our four rebalancing methods would have outperformed a hypothetical non-rebalanced portfolio. Figure 1 shows the average cumulative excess returns and hit rates (the percentage of all rolling periods in which the hypothetical rebalanced portfolio would have outperformed) for the various hypothetical rebalancing methods versus a hypothetical non-rebalanced portfolio with assumed initial allocations of 60% to global equities and 40% to U.S. bonds.

The hypothetical rebalanced portfolios would have outperformed a hypothetical non-rebalanced portfolio in a large majority of the historical 10-year rolling periods covered in our study, ranging from an 88.0% hit rate for a monthly rebalancing rule to a 89.6% hit rate for a rule that sought to keep relative exposures within ±2.5% bands. The average margin of cumulative excess return would have ranged from 4.22 percentage points (for monthly rebalancing) to 6.07 percentage points (for a rebalancing policy based on ±5% bands).

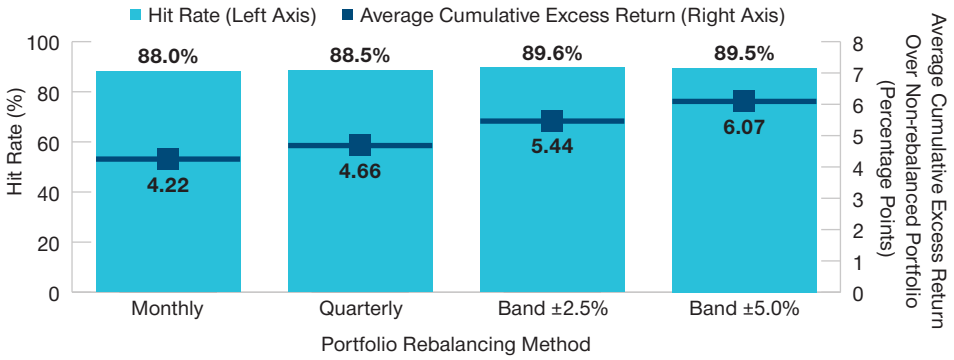
Assuming a hypothetical starting portfolio balance of USD 1,000,000, the average improvement to ending balances from adhering to one of the rebalancing rules we tested would have ranged from USD 42,199 to USD 60,652.

Stick to the Policy Even During Market Drawdowns

Despite the potential benefits of adhering to clear portfolio rebalancing rules, investors may be tempted to abandon their rebalancing policies during market drawdowns to avoiding buying into falling markets. To examine the potential pitfalls of such an approach, we analyzed our four rebalancing methods in a sample of historical and simulated market sell-offs.

Hypothetical Rebalanced vs. Non-rebalanced Portfolios[1]

(Fig. 1) Hit rates and average cumulative excess returns over rolling 10-year periods



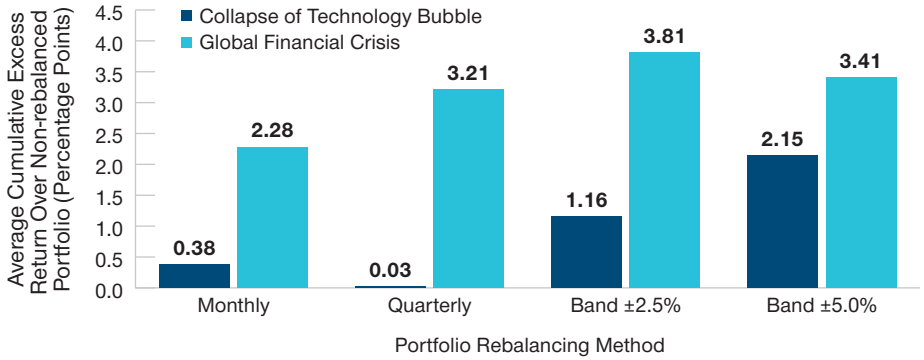
January 31, 1989, through March 31, 2020.

[1] Initial portfolio weights: 60% equity/40% bonds. Equities represented by the Morgan Stanley Capital International All Country World Index (MSCI ACWI); bonds by the Bloomberg Barclays U.S. Aggregate Bond Index. The results shown above are hypothetical, do not reflect actual investment results, and are not indicative of realized past or future performance. See appendix for rebalancing methodology. Sources: MSCI and Bloomberg Index Services Limited (see Additional Disclosures); all data analysis by T. Rowe Price.

> We found considerable dispersion across the rebalancing methods in terms of both the value added and the frequency of outperformance.

Outperformance of Hypothetical Rebalanced vs. Non-rebalanced Portfolios[1]

(Fig. 2) Average cumulative excess returns from market peak through trough and recovery



[1] Initial portfolio weights: 60% equity/40% bonds. Equities represented by the MSCI ACWI; bonds by the Bloomberg Barclays U.S. Aggregate Bond Index. The results shown above are hypothetical, do not reflect actual investment results, and are not indicative of realized past or future performance.
See appendix for bear market peak, trough, and recovery dates as well as information on rebalancing methodology.
Sources: MSCI and Bloomberg Index Services Limited (see Additional Disclosures); all data analysis by T. Rowe Price.

We first examined how the various rebalancing methods would have performed in two previous market events: the bear market that followed the technology bubble of the late 1990s, and the 2007–2009 global financial crisis. As shown in Figure 2, all of the hypothetical rebalanced portfolios would have outperformed a hypothetical non-rebalanced portfolio, on average, during and after the two historical market events.

We found considerable dispersion across the rebalancing methods in terms of both the value added and the frequency of outperformance. Moreover, while historical scenarios can be insightful, future market sell-offs and recoveries are likely to follow different paths. This observation prompted us to expand our analysis to study a wide range of simulated scenarios using Monte Carlo analysis to understand if certain rebalancing approaches could be more effective than others in market drawdowns.

In order to capture potential differences in efficacy across the four rebalancing methods analyzed, we modeled hypothetical equity/bond portfolios across 1,000 simulated equity market drawdowns and subsequent recoveries.

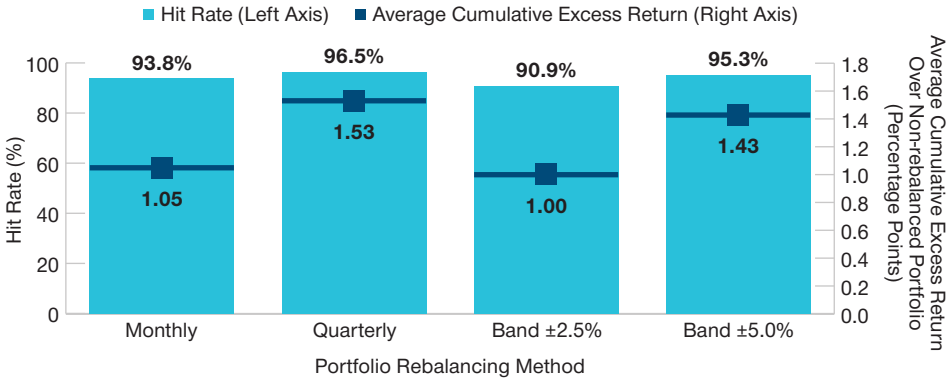
We sought to examine rebalancing methods from a variety of perspectives:

- Did the rebalancing methods work across the simulations in aggregate?
- Did the results change if we parsed the simulated data into more nuanced scenarios (e.g., depths and speeds of the drawdowns and recoveries)?

We found high conviction in our answer to the first question, as the hypothetical rebalanced portfolios outperformed a hypothetical non-rebalanced portfolio in the vast majority of our simulated downturns at meaningful levels. Specifically, Figure 3 shows the percentage of the simulated scenarios in which a hypothetical rebalanced portfolio outperformed a hypothetical non-rebalanced portfolio. In at least 90.9% of the simulated scenarios, the rebalanced portfolio outperformed the non-rebalanced portfolio.

Simulated Performance of Hypothetical Rebalanced vs. Non-rebalanced Portfolios[1]

(Fig. 3) Hit rates and average cumulative excess returns across all simulations



[1] Initial portfolio weights: 60% equity/40% bonds. Equities represented by the MSCI ACWI; bonds by the Bloomberg Barclays U.S. Aggregate Bond Index. The results shown above are based on Monte Carlo simulations. See appendix for information on simulation parameters and methodology.
Sources: T. Rowe Price, MSCI, and Bloomberg Index Services Limited (see Additional Disclosures); all data analysis by T. Rowe Price.

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While rebalancing operated in a falling market during the drawdown and in a rising market through the subsequent recovery, each method tended to outperform a hypothetical non-rebalanced portfolio over the full cycle. Additionally, as also shown in Figure 3, the outperformance of each rebalancing method versus a hypothetical non-rebalanced portfolio was meaningful, ranging from 1.00 to 1.53 percentage points of additional cumulative excess return versus the passively drifting non-rebalanced portfolio, which we would view as the "rebalancing alpha."

While we believe the aggregate results of our simulations make a strong case for rebalancing, the path-dependent nature of equity drawdowns and recoveries merits a closer look at the dispersion of potential outcomes across a variety of scenarios. Therefore, we examined subsets of results to ensure that our findings were robust across a range of simulated bear markets and recoveries. Specifically, we studied results within two segmentations of the data:

- the depth of the simulated equity drawdown
- the duration of the overall event from drawdown through recovery.

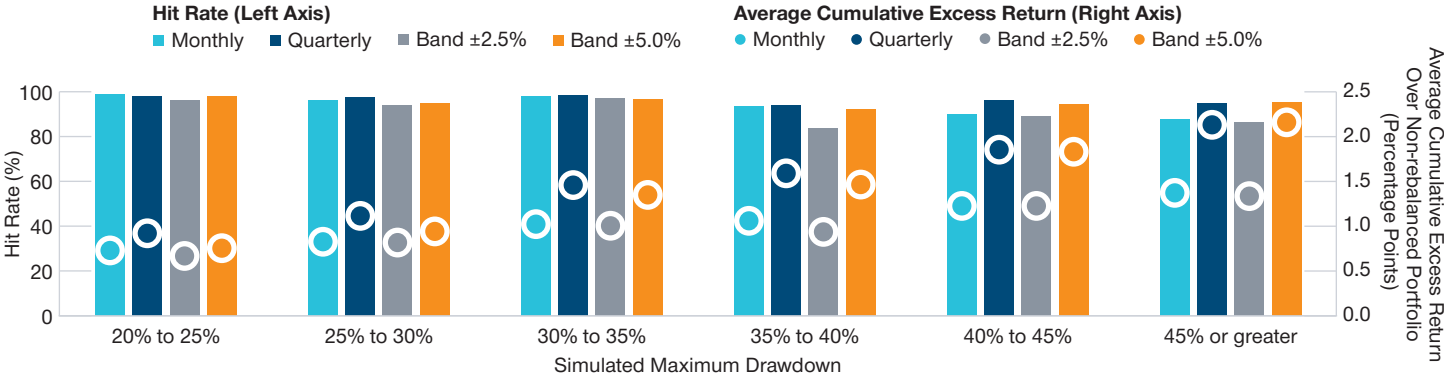
We again found that hypothetical portfolios that were rebalanced by any of the methods we modeled consistently outperformed a hypothetical non-rebalanced portfolio.

Figure 4 shows the results by equity depth. As noted, we saw outperformance across all rebalancing approaches. As the depth of the simulated equity market drawdown was deepened, we found that the looser rebalancing approaches (quarterly rebalancing and the ±5% bands) provided relatively better results. Intuitively, this made sense because, in a very deep drawdown, investors potentially could benefit by allowing their portfolios to drift into defensive assets. However, in reality, investors have no way of knowing the ultimate depth of a drawdown as they are experiencing it.

The most important takeaway here is that all of the rebalancing rules we examined potentially can add value, and investors should adhere to the approach that they believe makes the most sense given their overall situation.

Simulated Outperformance of Hypothetical Rebalanced Portfolios by Depth of Equity Drawdown[1]

(Fig. 4) Hit rates and average cumulative excess returns across all simulations



[1] Initial portfolio weights: 60% equity/40% bonds. Equities represented by the MSCI ACWI; bonds by the Bloomberg Barclays U.S. Aggregate Bond Index. The results shown above are based on Monte Carlo simulations. See appendix for information on simulation parameters and methodology.
Sources: T. Rowe Price, MSCI, and Bloomberg Index Services Limited (see Additional Disclosures); all data analysis by T. Rowe Price.

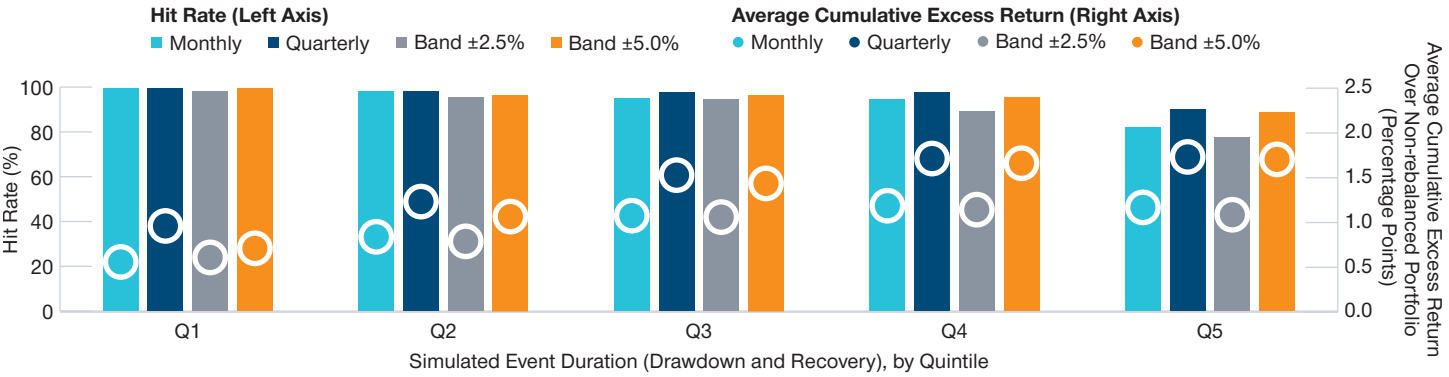
We also considered the dimension of time. Specifically, we studied the various rebalancing methods through drawdowns and subsequent recoveries of differing lengths. Again, Figure 5 shows that all of the rebalancing approaches we modeled consistently outperformed across scenarios, regardless of length.

It is important to distinguish between the two phases of a market sell-off: the drawdown and the subsequent recovery. Because a non-rebalanced portfolio allows risk-asset exposures to adjust with market movements and, thus, does not continue buying into risk assets during a decline, rebalancing may underperform during drawdowns. However, by regularly returning portfolio allocations to targeted weights, a rebalanced portfolio potentially can be better positioned for a subsequent market rebound. As a result, a rebalanced portfolio may lead a non-rebalanced portfolio in a recovery by a larger magnitude than its underperformance during the previous drawdown.

The fact that this conclusion held across various drawdown depths and event durations in our simulations gives us further confidence that investors should adhere to their usual rebalancing policies regardless of the market environment.

Simulated Outperformance of Hypothetical Rebalanced Portfolios By Total Event Duration[1]

(Fig. 5) Hit rates and average cumulative excess returns across all simulations



[1] Initial portfolio weights: 60% equity/40% bonds. Equities represented by the MSCI ACWI; bonds by the Bloomberg Barclays U.S. Aggregate Bond Index. The results shown above are based on Monte Carlo simulations. See appendix for information on simulation parameters and methodology.
Sources: T. Rowe Price, MSCI, and Bloomberg Index Services Limited (see Additional Disclosures); all data analysis by T. Rowe Price.

Conclusion

Rebalancing portfolios in accordance with a set policy helps align allocations with investor expectations and potentially helps minimize unintended risk. Our results show that disciplined adherence to a balancing policy, both over the long term and through periods of market stress, potentially can lead to a meaningful improvement in portfolio performance.

While we recognize that buying assets that are falling in value can be a difficult decision, we believe that investors should not abandon their normal rebalancing policies, especially during market sell-offs.

Appendix: Study Methodology

Hypothetical performance results (Fig. 2) are based on the following historical market events.

Historical Event	Drawdown Start	Trough	Recovery End
Technology Bubble Collapse	3/28/2000	10/9/2002	12/31/2005
Global Financial Crisis	11/1/2007	3/9/2009	4/29/2013

The date ranges shown above reflect the equity market peak for the MSCI ACWI prior to the downturn, the index trough, and the date of its recovery to the previous peak.

Simulation Analysis

The equity return paths in our simulations were based on the assumed parameters below and were modeled to reflect:

- drawdowns to a randomly chosen depth of -20% to -50%
- recoveries back to prior peak levels.

The performance of the hypothetical rebalanced and non-rebalanced portfolios were based on average daily returns and average daily standard deviation for the MSCI ACWI and the Bloomberg Barclays U.S. Aggregate Bond Index, pooled across drawdown and recovery periods for both the technology bubble and the global financial crisis. All index returns were gross of dividends.

Daily returns were assumed to reflect normal distributions, with the parameters defined below.

	Drawdown Environment	Recovery Environment
Equity: Mean Daily Return	-0.142%	0.086%
Equity: Volatility of Daily Returns	1.422	0.943
Fixed Income: Mean Daily Return	0.032	0.020
Fixed Income: Volatility of Daily Returns	0.287	0.224

Rebalancing During Market Events

- **Starting allocations:** All portfolios were assumed to have starting allocations of 60% equity/40% fixed income at market peaks, ±5% equity. Approximately half of the portfolios were assumed to begin with equity overweights and half with equity underweights within the 5% band.
- **Monthly rebalancing:** Portfolios following a monthly rebalancing rule were assumed to be initially rebalanced exactly 21 days from the start of the simulated market event and every 21 days thereafter.
- **Quarterly rebalancing:** Portfolios following a quarterly rebalancing rule were assumed to be initially rebalanced on a randomly chosen day within the first 63 days of the simulated market event and every 63 days thereafter.
- **Banded rebalancing:** Portfolios following banded rebalancing rules were assumed to be initially rebalanced when portfolio equity allocation deviated ±2.5% or ±5.0% versus their 60% equity allocation targets and each time such a deviation occurred thereafter.

Simulated Event Duration (Drawdown & Recovery) Quintile Breakpoints

Q1	Q2	Q3	Q4	Q5
0.42–1.72 Years	1.72–2.47 Years	2.47–3.23 Years	3.23–4.27 Years	4.27–9.95 Years

T. Rowe Price Methodology: Monte Carlo Analysis

Monte Carlo simulations model future uncertainty. In contrast to tools generating average outcomes, Monte Carlo analyses produce outcome ranges based on probability thus incorporating future uncertainty. The projections are hypothetical in nature, do not reflect actual investment results, and are not guarantees of future results. The simulations are based on assumptions. The materials present only a range of possible outcomes. Actual results are unknown therefore results may be better or worse than the simulated scenarios. Investors should be aware that the potential for loss (or gain) may be greater than demonstrated in the simulations.

Modeling Assumptions

The primary asset classes used for this analysis are outlined in the Appendix. The analysis includes 1,000 scenarios. The portfolio is assumed to be rebalanced based on rules outlined in the Appendix.

Material Assumptions

The primary assumptions underlying the analysis are mean daily returns and the volatility of daily returns of asset classes based on historical periods and the indexes noted in the Appendix.

Material Limitations

The analysis relies on return assumptions of asset classes (not investment products) to generate a wide range of possible return scenarios. There is no certainty that the future path of asset class returns is within the range of outcomes modeled. As a consequence, the results of the analysis should be viewed as comprehensive, but not exhaustive. Users should also keep in mind that seemingly small changes in input parameters may have a significant impact on results.

Additional material limitations include:

- Market crises can cause asset classes to perform similarly, lowering the accuracy of our projected return assumptions, and diminishing the benefits of diversification (that is, of using many different asset classes) in ways not captured by the analysis. As a result, returns actually experienced by the investor may be more volatile than projected in our analysis.
- Asset class dynamics, including but not limited to risk, return, and the duration of drawdown and recovery environments, can differ than those in the modeled scenarios.
- The analysis does not use all asset classes.
- Taxes, transaction costs, other potential expenses, potential for alpha from active management, and investment management fees are not taken into account.

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ID0003313 (05/2020)
202005-1190298